

Redroot pigweed (*Amaranthus retroflexus*).

Model summary (Table 3) and analysis led by Aaron Heinrich, OSU CSS Dept., with assistance from Ed Peachey, Nick Andrews, Hiedi Noordijk, and Leonard Coop, Oregon State University. CROPTIME project funded by USDA-Western SARE.

Methods: Using events monitored in the field, the lowest C.V. (coefficient of variation) was used to determine lower (Table 2 & Fig. 1) and upper threshold values based on 7 site-years, all from the Willamette Valley of Oregon (2013 n=3; 2014 n=2; and 2015 n=2). Sites (Table 1) included the OSU Vegetable Farm (near Corvallis, OR), Gathering Together Farm (near Philomath, OR), the OSU NWREC research farm (near Aurora, OR), and Sauvie Island, OR. One site-year (2014, OSU Vegetable Farm, Corvallis, OR) was removed from the analysis as an outlier. Degree-day values were calculated by the corn GDD method (also used by Huang et al. 2000 for this weed species) using the online calculator at uspest.org. The single sine method was also compared to the corn GDD method but produced higher C.V. values (data not shown).

The main model interval used to determine thresholds was from cotyledon stage to first germinable seed (the date when 1 or more seed germinated following treatment with gibberellic acid and incubated in the dark at 30°C). The stages from cotyledon to first emerging inflorescence, and from first inflorescence to first germination, were also tested for lowest C.V. (Table 2).

Table 1. Primary data used to derive redroot pigweed model.

Site-year	Year	Site	Field	Weather station	Start date (coty)	Date first germinable seed	Days coty to first germinable seed	Corn GDDs (46/89)
1	2013	Sauvie		E5POR ODEQ	5/12/13	7/16/13	65	1126
2	2013	47th		ARAO agrimet	5/31/13	7/16/13	46	915
3	2013	VF	A7	CRVO agrimet	6/21/13	8/9/13	49	1104
4	2014	GTF		CRVO agrimet	5/28/14	7/25/14	58	1087
5	2014	VF	Pop-up	CRVO agrimet	5/23/14	7/16/14	54	967
	2014	VF	Fum	CRVO agrimet	6/9/14	7/21/14	42 ^{removed} →(843)	
6	2015	VF	EF	CRVO agrimet	07/02/15	8/21/15	50	1182
7	2015	NWREC	June	ARAO agrimet	06/29/15	8/14/15	46	1166
Mean:							51.3	1078.1
SD:							7.5	100.4
CV (sd/mean)							14.6	9.3

Table 2. Days and cumulative GDD (Tlow=46F and Tmax=89F) for each growth interval.

Growth interval	Mean (days)	Range (days)	CV		Range (GDD)	CV (GDD) (%)
			(days) (%)	Mean (GDD)		
Cotyledon to emerging inflorescence (0.25-0.5" visible)	28	25-33	13.4	537	368-633	19.4
Emerging inflorescence (0.25-0.5" visible) to 1st germination ¹	23	17-28	16.3	553	434-613	13.2
Cotyledon to 1st germination ¹	53	46-65	13.3	1078	915-1182	9.3
Lower 95% CI				1004		
Upper 95% CI				1152		

¹Date when 1 or more seed germinated following treatment with gibberellic acid and incubated in the dark at 30C

Table 3. Degree-Day Model Summary.

Model:	Redroot Pigweed, <i>Amaranthus retroflexus</i>	
Calculation method:	Corn GDD (this method is based on simple average DDs but substitutes Tupper when the daily max temperature exceeds Tupper; and substitutes Tlow when the daily low temperature is lower than Tlow).	
Tlow:	46°F	7.8°C
Tupper:	89°F	31.7°C
Region of known use:	Willamette Valley, Western Oregon	
Validation status:	New research model based on 7 site-years	

Events table	DDs (F)	DDs (C)
0. Cotyledon (start)	0	0
1. 2 leaves present	121	67
2. 4-5 leaves present	189	105
3. 6-7 leaves present	277	154
4. First flowering	537	298
5. First germinable seed (lower 95% CI)	1004	558
6. First germinable seed (mean)	1078	599
7. First germinable seed (upper 95% CI)	1152	640

First germinable seed $Thi=130$

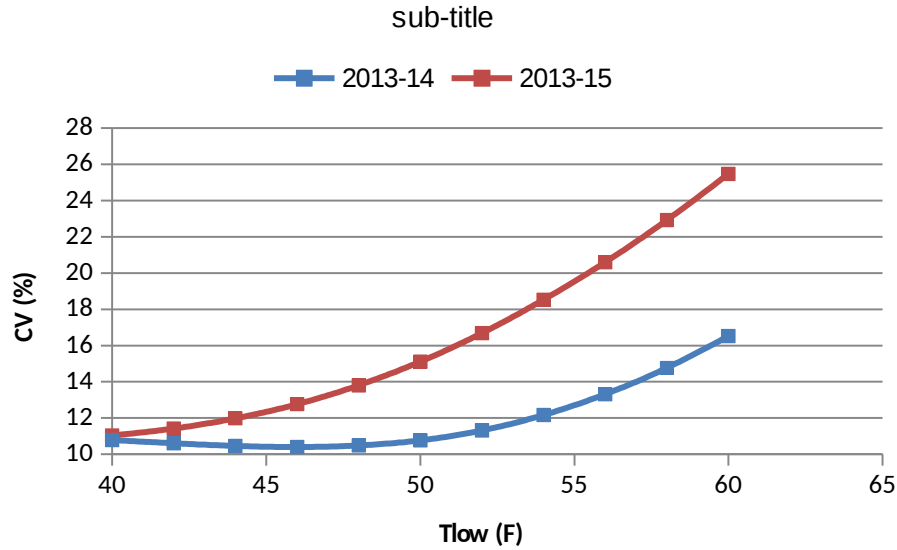


Figure 1. Lowest C.V. used to determine Tlow for redroot pigweed.

References Cited

Huang, J.Z., A. Shrestha, M. Tollenaar, W. Deen, H. Rahimian, and C.J. Swanton. 2000. Effects of photoperiod on the phenological development of redroot pigweed (*Amaranthus retroflexus* L.). *Can. J. Plant Sci.* 80: 929-938.

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